

BIOLOGICAL NOTES ON *OCYPUS OLENS*,
A PREDATOR OF BROWN GARDEN SNAIL,
WITH DESCRIPTIONS OF THE LARVA AND PUPA
(COLEOPTERA: STAPHYLINIDAE)¹

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INTRODUCTION

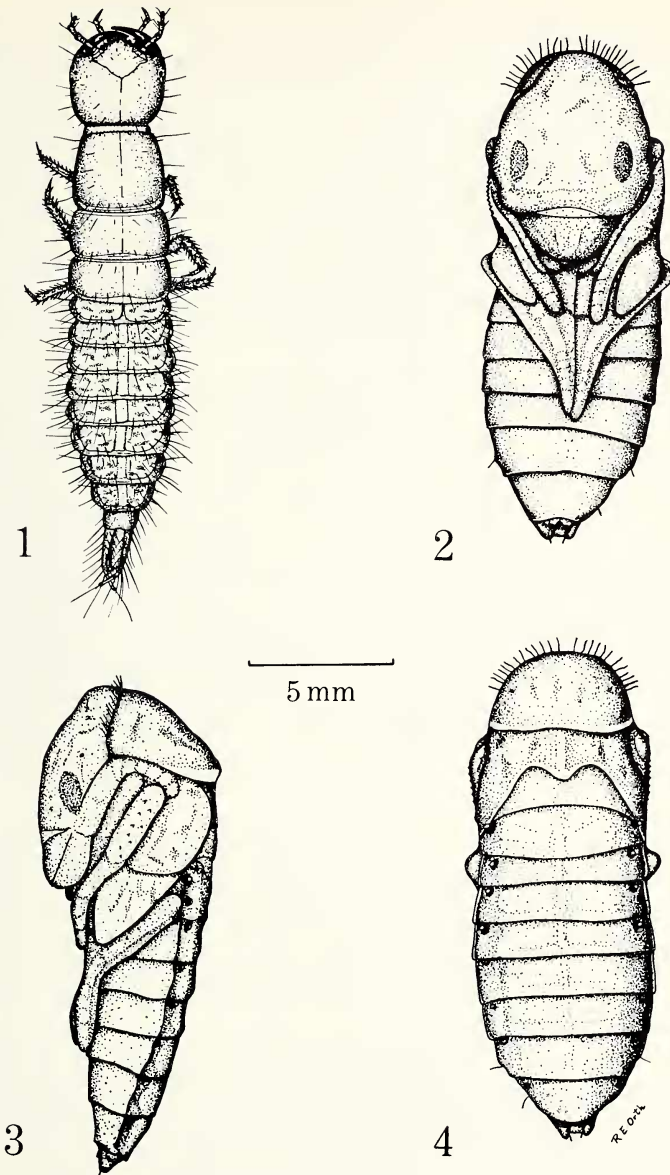
In a recent article by Orth, Moore, Fisher, and Legner (1975) laboratory studies of the snail eating habits of an adult specimen of *Ocypus olens* Müller were reported. Since then there has been opportunity to conduct similar studies of several larvae of the same species. The egg remains unknown. These larvae readily consumed snails, thus also demonstrating a potential for snail control. This view is further encouraged in the Riverside garden of one of the authors (I. Moore) which has a well established population of *O. olens* but a very low population of *Helix aspersa* Müller (brown garden snail). Other nearby gardens where *O. olens* appears not to be established have much higher population densities of *H. aspersa*.

The host snail employed in our laboratory studies was *Helix aspersa*. In California this snail has long been considered a major agricultural and suburban pest with an omnivorous diet which includes living and decaying vegetables, flowers, ground cover, citrus leaves and fruit as well as paper labels and cardboard cartons and cadavers of its own species.

The rove beetle *Ocypus olens*, sometimes referred to as the devil's coach horse, is a large (to 32 mm) black staphylinid indigenous to Europe. In North America it is known only from California where it was first recorded in southern California in 1931 (Orth, et al., 1975). Since that time distributional records extend about six hundred miles to the north.

In California both *Ocypus olens* and *Helix aspersa* seem to prefer cultivated or landscaped habitats. In the field we have seen and collected *O. olens* only in areas disturbed by man. This beetle therefore would seem to pose no threat to California's native land snails, which are generally found in the undisturbed hillsides, mountains, and deserts.

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Figs. 1-4. *Ocybus olens* Müller. Fig. 1, larva; Fig. 2, venter of pupa; Fig. 3, side of pupa; Fig. 4, dorsum of pupa.

MATERIALS AND METHODS

The larvae used in this study were from the garden of the Ian Moore residence in Riverside. Repeated attempts for over a year to obtain larvae of *Ocypus olens* at that site had failed until 4 April 1975 when 5 large larvae ranging in size from 21 to 25 mm were found beneath oleander plants. Under these plants was a dense accumulation of decomposing leaves from the oleanders as well as from neighboring trees. The habitat was very moist as a result of recent rains. The 5 *O. olens* larvae were underneath or within this material. One of the larvae was injured with a trowel and consequently died. The remaining four were brought to the laboratory for biological studies.

In the laboratory each beetle larva was housed in a circular 16 oz. plastic food container with a wire screen lid. Room temperature was maintained at $23^{\circ}\text{C} \pm 1^{\circ}$. The substrate within the containers consisted of $1\frac{1}{4}$ to $1\frac{1}{2}$ inches of moist soil from the collecting site. A loose mulch of dead leaves approximately $\frac{1}{2}$ inch in depth was added on top of the soil. Two *Helix aspersa* whose shells measured about 10 to 12 mm were placed in each unit. Small amounts of lettuce were added as food for the snails and also to induce them to come down from the top or side of the container where they would be more vulnerable to staphylinid attack. As snails were killed fresh hosts were added so there were never more than two living snails per observation unit.

BIOLOGY

The larvae of *O. olens* were fed an exclusive diet of *Helix aspersa* for a period of 2 to 3 weeks. During this period larvae consumed from 2 to 8 snails each. Attack and feeding usually occurred at night. Generally, the shells were left intact. However, some of the smaller shells showed various degrees of destruction from the body whorl to the apex. Attack by an adult beetle resulted in more severe mutilation of the shell.

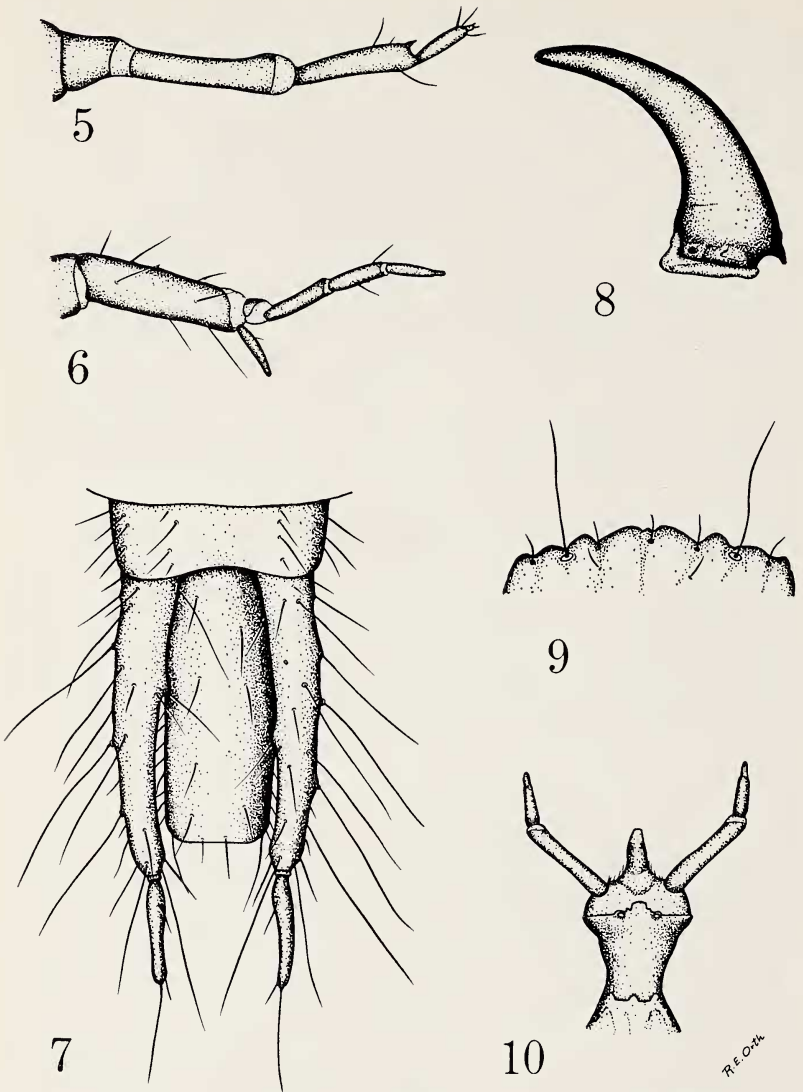
Once feeding was completed the mature larvae then burrowed through the substrate to the bottom of the unit and formed individual cells which were elliptical in shape, approximately 2.5 cm long, and 1.6 cm high and flat on the bottom as a result of the container shape. Had the substrate been deeper the larvae probably would have burrowed to a greater depth as all cells were tight against the bottom of the unit.

Once the larvae were housed within the cells they remained inactive without visual physical change for a period of about 10 days. Pupation then took place. Visual observations were facilitated by the clear plastic containers.

The newly transformed pupae were testaceous and about 18 mm in length. They changed rapidly from testaceous to piceous 9 to 14 days after pupation. The pupa illustrated was removed from the substrate and held in a covered petri dish which contained dampened filter paper to preserve moisture. This greatly facilitated the drawings and observations. Eighteen days after pupation it appeared ready for emergence. However, for reasons not understood, the specimen in the petri dish and those that remained in the plastic containers failed to emerge. An additional mature larva (29 mm) was brought into the laboratory 30 May 1975. Shortly thereafter, without any laboratory feeding, it burrowed to the bottom of the unit. It then pupated but it too failed in its final development.

MATURE LARVA OF *OCYPUS OLENS* (Müller)

Length 21.0 mm. Body elongate, somewhat convex, subparallel, tapered to apex of abdomen; piceous with the appendages paler; foreparts shining, abdomen finely densely reticulate and dull. Head oval, very slightly wider than long; with four ocelli grouped in a compact square at each side behind the base of the mandible. Clypeus with nine short blunt teeth, the center one smallest (another specimen lacked the center tooth), the next two very broad, occupying about two-fifths of the width of the clypeus. Antennal fossa located at front of the head slightly basal to and between the base of the mandible and the clypeus. Antenna four-segmented, first segment short, almost as wide as long; second segment a little narrower than first, about four times as long as wide; third segment narrower and shorter than second, four times as long as wide, with a minute "acorn seta" at apex; fourth segment a little more than half as long and about half as wide as third, about four times as long as wide. Mandibles arcuate, acute at tip, without internal teeth. Maxillary palpus five segmented; first segment short, stout, not forming a complete ring, possibly representing the galea; second segment more than three times as long as wide; third segment a little shorter and a little narrower than second; fourth segment shorter and hardly more than half as wide as third; fifth segment one-third as long and one-half as wide as fourth, tapered to pointed apex. Mala cylindrical, narrower than second segment of maxillary palpus and about half as



Figs. 5-10. Larva of *Ocybus olens* Müller. Fig. 5, antenna; Fig. 6, maxilla; Fig. 7, urogomphus and pseudopod; Fig. 8, mandible; Fig. 9, anterior margin of the clypeus; Fig. 10, labium.

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long, without setae. Labial palpus three-segmented; first segment four and one-half times as long as wide, cylindrical; second segment a little narrower than first and about one-third as long; third segment narrower than second, about one-third as long, pointed. Ligula cylindrical, about as wide as first segment of labial palpus and less than half as long. Pronotum a little wider than long, about as wide as head; with three setae each side along anterior margin; five each side along posterior margin; two discal setae each side; three large and several small setae in the lateral series. Anterior face of protibia with a row of six or seven closely placed setae at distal edge which are less than one-third the length of the major setae near them. Mesonotum and metanotum of about equal size and shape, each about as wide as pronotum and about half as long; each with about twelve setae each side along the anterior margin, about eight setae along the posterior margin, with several lateral setae and no discal setae. Abdominal segments of about equal length, diminishing in width so that the abdomen is tapered; each tergite on each side, with about five setae along the anterior margin, five in a transverse row along the disc and five along the posterior margin. Spiracles prominent on all abdominal segments. Pseudopod cylindrical, more than twice as long as wide. Urogomphus two-segmented, first segment about half as wide and slightly longer than pseudopod, second segment about half as wide as first segment and about one-third as long.

One specimen Riverside, Riverside County, California, 11 March 1972, Ian Moore collector.

PUPA OF *OCYPUS OLENS* (Müller)

Length 18.0 mm. Elongate, piceous with the mesonotum and metanotum paler, heavily chitinized, surface minutely reticulate and dull. Head longer than wide, ventrally reflexed so that it is not visible from above, with a large dark eye spot each side, without tuberculi or setae. Antennae curved over legs, reaching to the tibio-femoral joint of the middle leg. Pronotum about as long as wide, arched, with a row of stout setae at the front margin divided into two series by a gap in the center which is more than twice as wide as the distance between the other setae; twelve setae on the right side and thirteen on the left. Mesotibia with a row of nine tubercles along the posterior edge and an adjacent row of six tubercles. Metatibia with a row of five small tuberculate hooks with their apices hooked distally. Elytra reaching to mid point on mesotibia. Apices of wings extending posteriorly from apex of elytra to about

the same length as elytra. Abdomen eight segmented; first four segments with prominent raised spiracles each side; last four segments with small spiracles each side; seventh and eighth sternites with a stout seta projecting laterally each side so that it is visible from above. Urogomphus short, blunt.

One specimen collected at Riverside, Riverside County, California, 4 April 1975 by R. E. Orth, reared to mature larva which pupated and died 13 May 1975.

DISCUSSION

It has been demonstrated in the laboratory that the larvae as well as the adults of *Ocypus olens* are predaceous on brown garden snails. In order to pursue biological control field studies with *O. olens* as a possible agent for control of *Helix aspersa*, insectary production of the beetles in large numbers will be necessary. Therefore further biological investigations are planned. An objective of critical importance to this total effort is to learn why fully formed and healthy looking pupae did not transform to the adult stage. We speculate that perhaps in the observations thus far completed optimum temperature, moisture, or even light were not provided.

LITERATURE CITED

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1975. A rove beetle, *Ocypus olens* (Coleoptera: Staphylinidae), with potential for biological control of the brown garden snail, *Helix aspersa* (Stylommatophora: Helicidae), in California, including a key to the Nearctic species of *Ocypus*. Can. Ent. 107: 1111-1116.